

Vol. XI

JANUARY, 1924

No. 1

JOURNAL
OF THE
BOSTON SOCIETY
OF
CIVIL ENGINEERS



Published monthly, excepting July and August, by the Society,
715 Tremont Temple, Boston, Massachusetts.

Entered as second-class matter, January 15, 1914, at the Post Office at Boston, Mass.,
under Act of August 24, 1912.

Acceptance for mailing at special rate of postage provided for in Section 1103,
Act of October 3, 1917, authorized on July 16, 1918.

Subscription Price, \$4.00 a year (Ten Numbers)
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BOSTON SOCIETY OF CIVIL ENGINEERS

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PAPERS AND DISCUSSIONS

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HYDRO-ELECTRIC DEVELOPMENT WITH SPECIAL
REFERENCE TO THE HYDRAULIC EQUIPMENT

BY WILLIAM MONROE WHITE,* Member of A.S.M.E., A.I.E.E. and Franklin
Institute

(Presented December 19, 1923.)

THE advance of civilization has been in step with the utilization of the forces of nature for relieving man from toil. The people, of a right, should look to the engineer to point the way in the development of our resources which will lead to the minimum of human toil as they have looked in the past to the medical profession for relief from human ills. The purpose of this paper is to present for your consideration and discussion economical means for the development of one only of the stores of energy, that is, of the power to be derived from falling water.

Let us first take stock of the world's energy available from water power only. On the basis of 75 per cent of the theoretical power available for 75 per cent of the time, the world's supply of energy in water power is shown from compilations to be about four hundred and forty million horsepower. Of this amount, two hundred million is available in Africa, seventy-five million is available in Asia, sixty million in North America, fifty million in South America, and forty-five million in Europe. The power so far developed is not in proportion to the potential power

* Manager and Chief Engineer, Hydraulic Department, Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

but rather in proportion to enlightenment in intelligence of the people. There has been developed and is now in operation on the North American continent slightly over twelve million horsepower from water, in Europe slightly over nine million horsepower, in Japan slightly over one million horsepower, in South America about four hundred thousand horsepower, and in that tremendous storehouse of Africa less than twenty-five thousand horsepower. From the above it may be seen that 53 per cent of the total hydraulic power in the world has been developed on the North American continent. There has been developed in the United States nine million horsepower, and in Canada two and one-half million horsepower. In studying the potential powers of the various countries a curious fact was unearthed, and that was that the plains of the North American continent lie at lower elevations with reference to the sea level, while in Africa the plains lie at the higher elevation, whereon the waters are collected and run off in large rivers around the edges of these high plains, affording a great amount of power. In other words, the streams become large before they fall to the sea and then they fall abruptly. The Congo River Basin affords greater potential water power than any other basin in the world, being more than the total potential power of North America.

The saving of man power effected by the development of water power is very clearly illustrated by the putting into operation at Niagara Falls very recently of one 70,000-horsepower water wheel unit, which is operated by two men per shift of three shifts per day. It has been computed that to produce a like amount of power by steam it would require the services of fifteen hundred men to mine, hoist, sort, load, transport on railway cars to destination, including repairs to tracks and cars, and again to unload, store, again reload, deliver and fire under boilers sufficient coal to produce a like amount of power. An English statesman recently said in open Parliament meeting that the reason why the American manufacturer could compete successfully in the markets of the world, and yet pay twice the rate of wage to the American workman as was paid to the British workman, was because every American workman had behind him twice the horsepower per man that the British workman

had. Since the production of goods is in some proportion, and probably in direct proportion, to the amount of labor expended in its production, it naturally follows that the workman who can direct the greatest amount of power will, by the inevitable law of competition, receive the greatest wage. The following table gives certain pertinent features bearing on this matter. It should be noted that the total horsepower used in the table is the total power from steam and water. The table illustrates the relation between power available per workman and wages received by the workmen in the United States, Great Britain and Japan.

Horsepower per Capita and Daily Wages received in Various Countries

COUNTRY.	Population.	Total Horse-power, Water and Steam.	Horsepower per Capita.	Average Daily Wages of Laborers.
United States	106,000,000	35,000,000	0.330	\$4.75
Great Britain	46,000,000	9,000,000	0.195	3.20
Japan	56,000,000	2,500,000	0.045	0.99

There is in use today in the United States a total horsepower, including hydraulic, steam and gas of approximately thirty-five million; in other words, about one-third of a horsepower per person of the population.

One horsepower in mechanical power is equivalent to the mechanical power output of eleven men. We have, therefore, an equivalent of production units of several times our population, but the consumption capacity of that only equal to the population. The natural results are that we are producing more than we are consuming and our wealth consequently piles up.

It would seem, therefore, that it becomes the duty of every engineer to urge the further development of the water powers, which must inevitably lead to the greater comfort of the people.

It seems appropriate to state in this paper the present general practice governing the selection of machinery for various heads under which the engineer is called upon to develop power. Types of units divide themselves naturally into several classes, each applicable to a particular head.

TYPES OF UNITS FOR DIFFERENT HEADS

The standard open-flume construction, with which you are all familiar, is still generally used up to and including heads of 20 feet. Rarely is a spiral form used on this type of turbine. In some cases a nose or pointed obstruction is placed in the rear of the flume, directed to divert the water smoothly into the guide

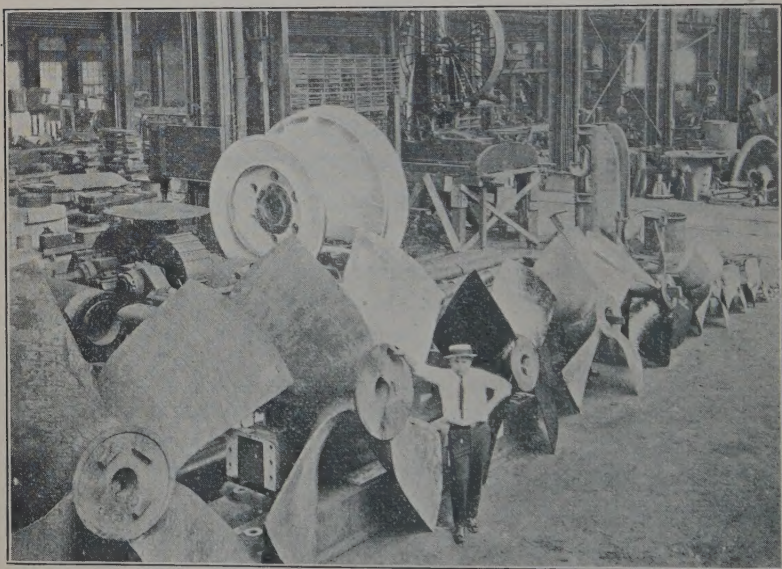


FIG. 1. — NAGLER HIGH-SPEED PROPELLER RUNNER.

For Low Head Developments.

chamber. The modern tendency toward larger units has made the vertical type the more economical and the most efficient for the low heads. The tendency has been to increase the size of the units under low heads. This has meant, naturally, decreased speed, but decrease in speed has meant a greater cost of generator, consequently there has been an insistent demand for higher speeds under the lower heads. It should be pointed out that the generator is not only more costly with a decreased

speed, but its efficiency is less. Mr. Nagler* has supplied a much-needed type for low heads with his high-speed propeller runner. This type of runner is illustrated in Fig. 1. It provides practically double the speed which had previously been possible on these low heads for a given power and head. The simplicity of the runner appeals greatly to those operators who had previously been troubled with trash and anchor ice. The small number of blades, usually four, enables the designer to concentrate his material in such a way as to add greater relative strength to this type of runner.

As another range we might take the heads from 20 feet to 60 feet. The tendency is to equip units within this range with

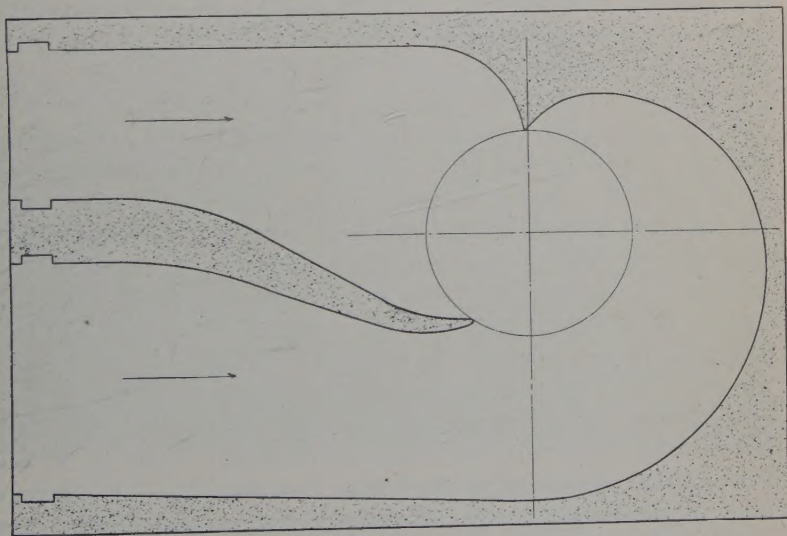


FIG. 2. — SKETCH SHOWING CONCRETE SPIRAL CASING WITH NOSE ON CENTER LINE.

concrete spiral casings and to make the turbines with outside operating mechanisms. The size of the units within this range of heads is such that the design of the hydraulic machinery

* Mr. F. Nagler, Hydraulic Engineer, Allis-Chalmers Manufacturing Company, Milwaukee, Wis. See his paper, "A New Type of Hydraulic-Turbine Runner," Vol. 41, No. 12, *Mechanical Engineering*.

fixes the distance from center to center of units in the power house, rather than the electrical apparatus. For economical reasons a concrete spiral casing must be kept as small as possible, since, as a rule, they fix the center to center distance of the units. It has been our practice to place the nose of the spiral on the longitudinal center line of the power house. This provides that the water which passes downstream of the longitudinal center line of the power house in the spiral casing does not again pass upstream of this center line. This means that the dimensions of the spiral may be made the least possible for a given limited maximum velocity of water to be used in the spiral casing. This type of spiral casing is illustrated in Fig. 2. In this design some particles travel half way around the wheel, whereas in the usual cast-iron spiral casing some of the water makes practically a circle around the wheel.

The next natural range would be from 60 feet to 300 feet, and might be termed "The Metal Spiral Range." Of course, the concrete spiral has been constructed for heads considerably above 60 feet; also, plate steel spiral casings have been built for heads as low as 45 feet, and the results have shown that they were more economical in the plants where used than the concrete spiral would have been. It is well to give full consideration to this range from 60 feet to 300 feet because within this range lies the greatest development in horsepower in the United States in the future, as well as throughout the world. The general impression prevailing, that all of the good high heads have been utilized and that the future development would be in low heads, is not borne out by the facts. Compilation of the surveys made of the water powers of the world show that 70 per cent of all of the potential water power not yet developed lies within this range of 60 feet to 300 feet. One-half of the total horsepower of turbines constructed by the Allis-Chalmers Manufacturing Company during the last four years has been within this range. The plate steel circular section spiral casing is being generally used and specified for heads up to 225 feet, and in some cases has been used on heads as high as 350 feet, the installation of three circular section plate steel spiral casings of 19,500 horsepower capacity for the New England Power Com-

pany, under a head of 345 feet, being a good case in point. The plate steel spiral casing is a logical development since it is merely continuing and extending the plate steel penstock around the turbine. Cast steel spiral casings are used throughout the upper limits of this range. The difficulties of casting the sections of these large spirals has been overcome in our own case by casting the speed vane ribs integral with the spiral casing, and dividing the casing into a large number of sections. Mr. H. B. Taylor



FIG. 3. — SHOP ASSEMBLY OF A 22,500 H. P. IMPULSE WHEEL.
For Big Creek No. 1 Plant, Southern California Edison Company.

has provided a good means of sectionalizing the speed ring from the casing which is very satisfactory. The cast steel spiral casing has so far been used exclusively for heads ranging from 300 to 850 feet. The range of the impulse wheel overlaps that of the Francis turbine, beginning probably at 500 feet, coming into exclusive range at 850 and having no upper limits except that of strength of materials. The upper limit of application is now 3,000 feet. The most noted high head installation in this

country is that of the Southern California Edison Company, at Big Creek, powerhouses Nos. 1 and 2. Fig. 3 shows a shop assembly of a twenty-two thousand five hundred horsepower unit for this development and Fig. 4 shows two thirty thousand horsepower impulse wheels in the Caribou power house, Great Western Power Company.



FIG. 4. — Two 30,000 H. P. IMPULSE WHEELS.

Caribou Power House, Great Western Power Company.

The double overhung with a single jet on each wheel remains the standard, and is receiving such support as will probably make it the leading type for several years to come.

While the vertical impulse unit has been used in some plants, the great favor which the double overhung horizontal has been accorded in the West, and the excellent performance and long life which it has given and maintained, fixes a well-founded practice from which one hesitates to depart. The tendency in development is in the line of higher speeds for given power and head. The efficiency of the impulse wheels has been pushed up to remarkably high limits.

DRAFT TUBE

The greatest advances in the art of developing power from water have been made in the improvement of the form of the passages from the runner to the tail race. The ever-increasing size of the units has meant larger diameters of runners. The ever-increasing speed for given types has meant greater percentage of the total energy discharged from the runners. As the percentage of energy discharged has increased, the energy lost in the draft tube has also increased. This has resulted in the runner being set nearer to the level of the tail water than formerly. The increase of size of runner and increase of loss therefrom have meant that the heretofore curved draft tube has had to be made larger in diameter and of a shorter radius of curvature. The shorter the radius of curvature, the less the regain. The high specific speed of runners has caused the water to leave the runner in a greater state of whirl than formerly. The hydraucone draft tube provides for radially extending passages in which the whirling water may be made to pump itself out against the tail water level, thereby increasing the efficiency of the wheel.

The obtaining of higher specific speed has resulted in the forcing of a greater amount of water through a given diameter of runner which, of course, means a greater percentage of the energy of the given development discharged from the runner. If high plant efficiency is to be obtained this discharged energy must be utilized effectively. This is the fundamental reason for the great amount of experimenting and developing on draft tubes which has been done in the past ten years and is now at what seems to be "fever heat."

The hydraucone draft tube is not limited to a flat plate or flat bottom, but contemplated in its original conception the use of cone centers. Such cone centers have been found effective for use with runners, which by reason of their high efficiency and critical design might be unstable.

The hydraucone* provides a means for regaining the dis-

* See article by W. M. White, presented at the Chicago meeting of the American Society of Mechanical Engineers, May 23, 1921, "The Hydraucone Regainer, its Development and Applications."

charged energy effectively within a short space measured in the direction of flow from the wheel, thereby saving excavation. The hydraucone has radial passages and provides for the regain of the whirling energy leaving the high specific speed wheels. The old form of curved draft tube is too inefficient to have a place in modern development. A new form of curved tube for utilizing a portion of a hydraucone has been developed and fairly good results obtained. This type is characterized by the lowering of the roof of the draft tube to form a constriction at the discharge end of the bend.

This type of tube when used with a long section of a horizontally expanding draft tube gives effective regain if the form of the curved tube is such as to provide for substantially parallel stream flow lines of about equal velocity at the entrance to the horizontal portion of the expanding tube. The radially extending passages of the hydraucone draft tube provide for regain of the whirling water discharged from the runner when the turbine is operating at part load. The hydraucone has an efficiency of 80 per cent, that is to say, 80 per cent of the amount of energy entering as velocity head is transformed into pressure head at discharge.

SPECIFIC SPEEDS

The following formula, $N_s = \frac{5050}{H+32} + 19$, gives the limits of specific speed which may serve as a basis for the discussion of this troublesome question. As a rule, runners of higher specific speeds than those indicated by the formula will pit or erode, but unfortunately it does not follow that runners designed with specific speeds below the limits set by the formula will not pit. In some cases it is more economical to select higher specific speeds than those indicated because of the reduction in cost and the increased efficiency of the generator, as contrasted to the cost of the repairs or replacements of the pitting or pitted runner. In selecting the limits of specific speed for a particular installation the varying cost of the generator in regard to speed should be carefully considered. In the case of large generators we have found that there is a definite point of flexure in the curve of

cost plotted in respect of speed and in large units this point of flexure frequently corresponds to a lower specific speed than that indicated by the formula.

GOVERNORS

The Integral Governor with the directly connected flyballs mounted on the main shaft affords a compact, reliable govern-

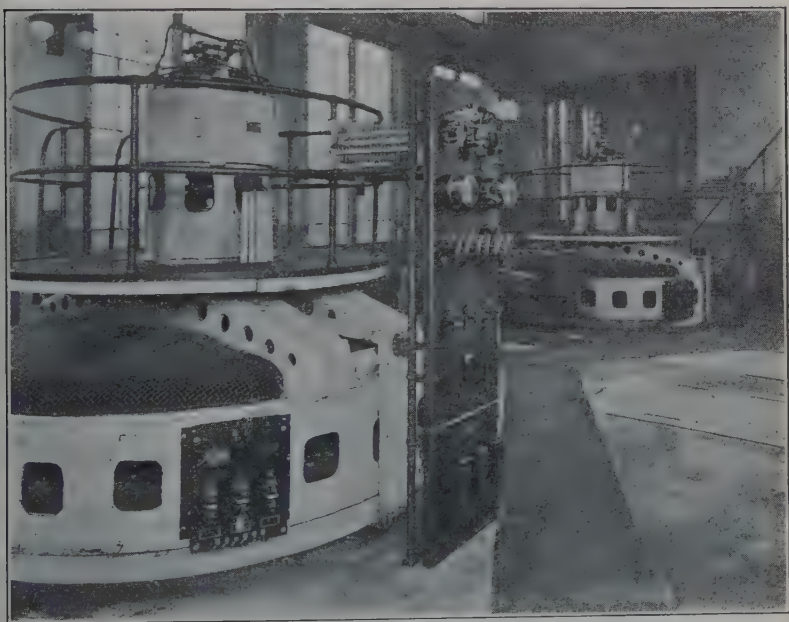


FIG. 5. — AUTOMATIC STATION AND CONTROL EQUIPMENT.

Detroit Edison Company.

ing mechanism. In the Integral Governor the operating valve is mounted directly over the operating cylinder of the turbine, avoiding the long reaches of pipes which are necessary when the regulating valve is mounted on a stand placed upon the generator floor. The splendid control which one may now have of the governor from a distant point no longer renders it necessary to place the governor alongside of the generator within jumping

distance of the station attendants. The great advisability of avoiding gears and belts is again emphasized in the use of motor-driven flyballs. The Allis-Chalmers Manufacturing Company's load-limiting device provides an effective means of setting a definite limit to the power of the turbine as desired and at will. We recently equipped several of our large installations with automatic shutdown devices. One plant in particular may be

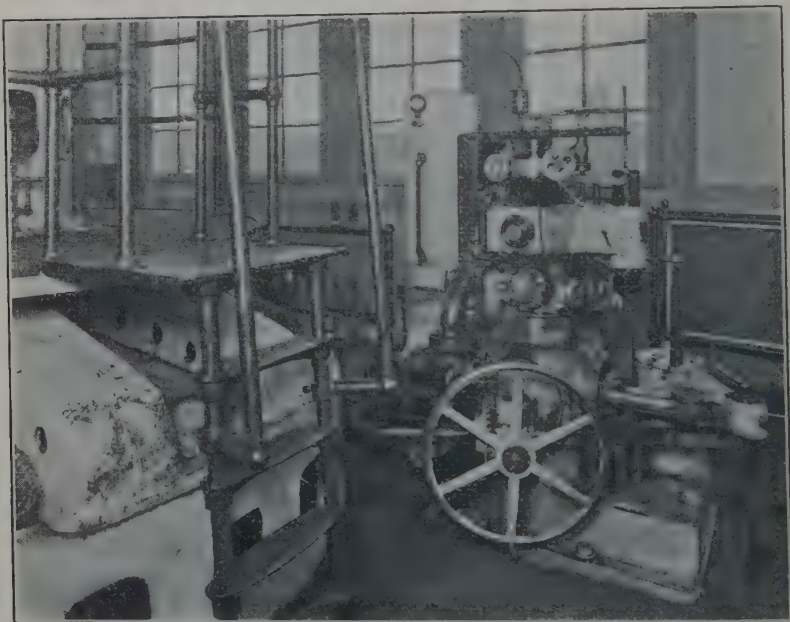


FIG. 6. — AUTOMATIC STATION AND CONTROL EQUIPMENT.

Detroit Edison Company.

mentioned. We have installed at the Wateree Power Company five units of seventeen thousand five hundred horsepower under an operating head of 68 feet. The distance between units is 50 feet. The switchboard is at one end of the power house at an elevation above the generator floor. It is manifestly impossible for the station operator to reach the governor of any unit without a considerable interval of time. This interval of time be-

comes a serious delay when a short circuit or burn-out takes place. Devices have been installed on the governor whereby the moving of a switch at the switchboard will automatically close the turbine gates and apply the brakes, at the same time tripping the circuit breakers and the field switches on the main machine. This simple device has been found to be a great comfort to the operating staff, and security to the plants.

AUTOMATIC STATIONS

The automatic station is now a developed and assured type of installation. The Allis-Chalmers Manufacturing Company has

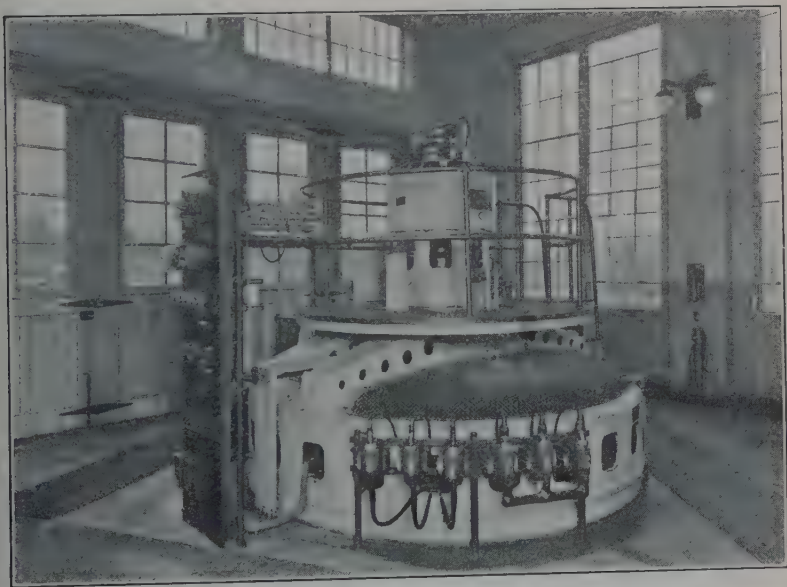


FIG. 7. — AUTOMATIC STATION AND CONTROL EQUIPMENT.

Detroit Edison Company.

in operation and under construction units and automatic control apparatus for ten such stations. (See Figs. 5, 6 and 7.)

The automatic station provides for the development of many low-head or small water-power projects which would not

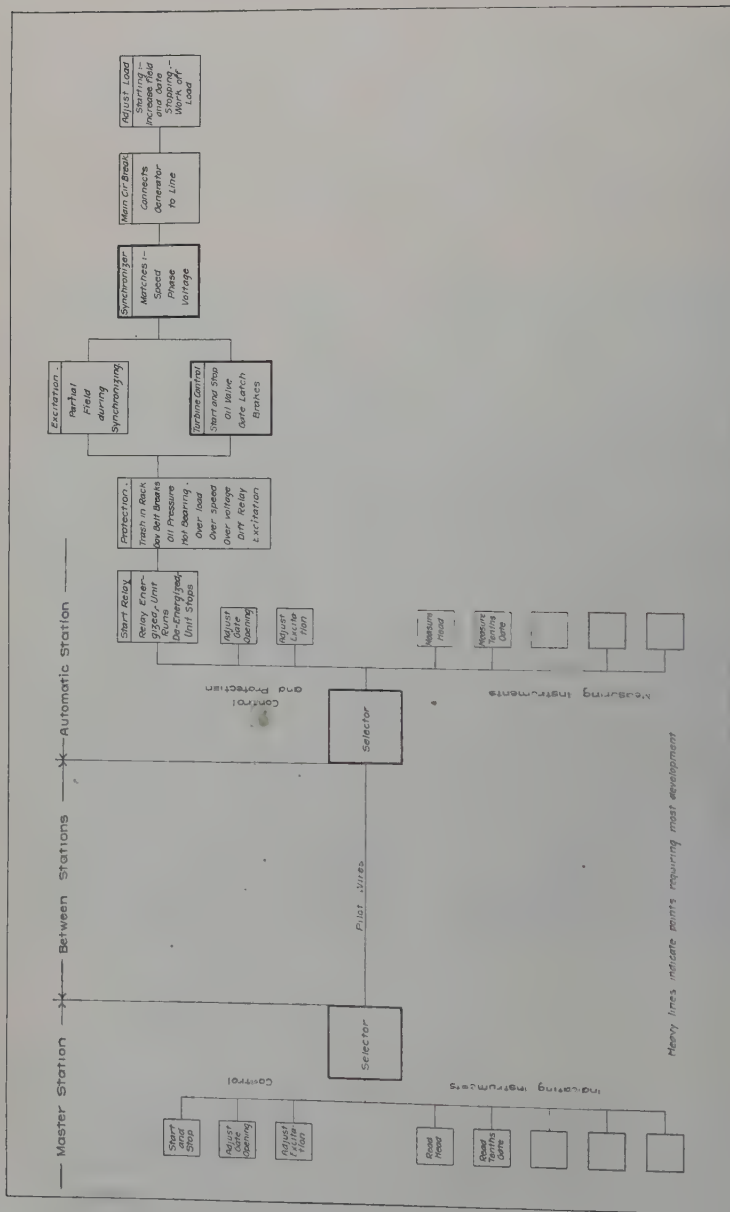


FIG. 8. — GENERAL SCHEME OF COMPLETE AUTOMATIC REMOTE CONTROL SYSTEM FOR HYDRO-ELECTRIC UNIT.

be economical if there had to be charged against its income the expense of the usual number of operators and attendants. The

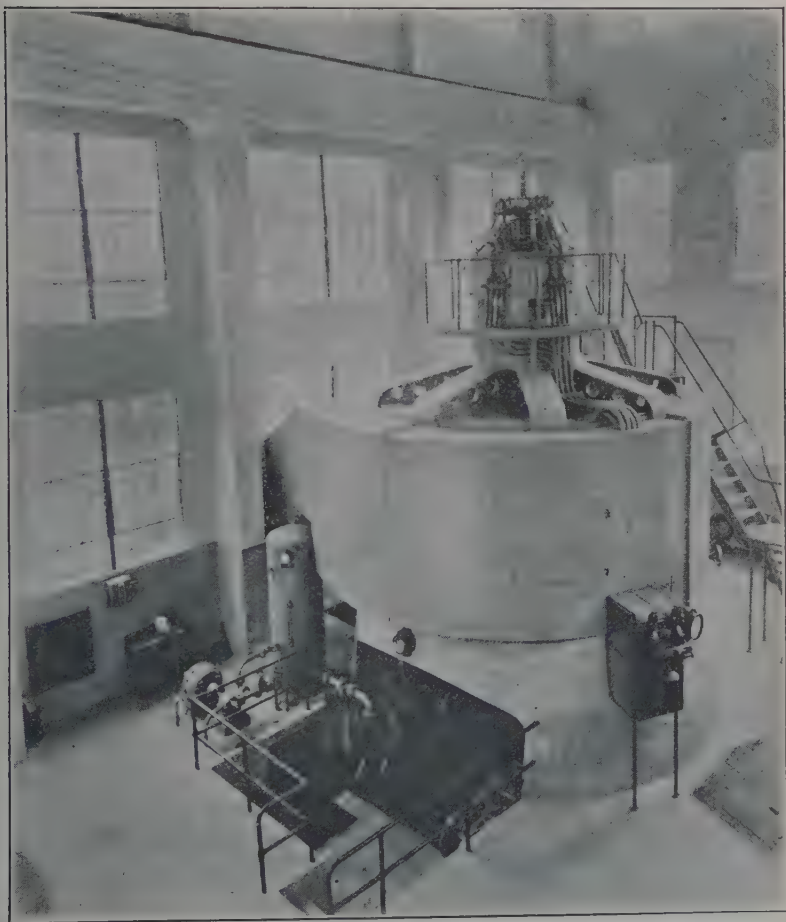


FIG. 9. — 12,000 H. P. UNIT IN "ONE-FLOOR" TYPE OF POWER HOUSE.

Kern Canyon Plant, San Joaquin Light and Power Company.

automatic station is usually within easy reaching distance of a "mother" station. It is amazing what these automatic features will accomplish in the way of starting the unit, synchronizing it,

putting it on the line and putting it under load. There are also many protective features, consisting of devices that will shut down the unit in case of trash-racks clogging up, governor oil pressure becoming too low, hot bearings, too low voltage or too high voltage, breaking of the governor belt, overspeed, or overload. While most of these functions are performed electrically, a number of them are accomplished by means of oil pressure. We may expect considerably greater development along this line. The chart, Fig. 8, illustrates some of the functions and some of the things accomplished by the automatic station.

POWER HOUSE DESIGN

Just as the automatic governor systems are designed to eliminate labor, so is the modern power house designed with a view to the least number of operators. The one-floor station is an established type. In such type the generator is usually mounted upon a concrete ring set above the flow line. The doorway is cut through this ring giving easy access to the turbine pit. Such a type of station is illustrated in Fig. 9, which shows a photograph of a twelve thousand horsepower unit in the Kern Canyon plant of the San Joaquin Light and Power Company, Fresno, California.

In this great country of ours the development of hydro-electric power has always meant prosperity for the community which it served. Let us then develop more hydraulic power.

Discussion

At the close of the paper the speaker was asked a number of questions on various phases of hydro-electric development. These questions (shown in *italics*) and Mr. White's answers are given below.

(1) *What is the maximum size of unit that is likely to be developed?*

We are now figuring on units of 100,000 horsepower each. This proposition is not yet up actively, but we are making studies to determine whether such a unit can be built. We

have proceeded sufficiently far with our designs to state that such a unit is feasible. The limiting feature in the design of a unit is that of the shaft and that of the runner. The first depends upon the maximum size of shaft forging which can be made and handled, and the second depends upon the size of runner which can be transported on the railway cars. However, it is not likely that we will see units of much over 150,000 horsepower capacity during our lifetime.

(2) Question as to the use of horizontal shaft compared with vertical shaft turbines.

The vertical shaft turbine is most excellent for large units because of the invention of Mr. Kingsbury, who has provided a bearing which will care for the tremendous weight of the rotating elements.

The principal reason for going to the vertical is that we avoid an elbow at the discharge of the runner which would have to be used on horizontal units. The loss around such an elbow is quite considerable, which, of course, means decrease in the efficiency of the machine. Another limitation is that of the height of the top of the runner above tail-water level. The size of units have now increased so that the discharge diameters of the runners are quite large, seldom less than 8 feet, sometimes 16 feet in diameter. The 16-foot diameter runner would mean that the top of the runner would come 8 feet above the center line of the horizontal shaft when the runner is placed in a horizontal position. The limit of elevation of the runner above tail water is fixed by hydraulic conditions and is seldom over 20 feet. Its exact limits depend upon the specific speed of the runner. It naturally follows that the larger the runner the lower the center line of shaft must be placed with reference to the tail-water elevation. This means that the level of power house, in the case of horizontal units, will be close to tail-water level, and as the back water in these large plants rises to considerable height above tail water it means that in the case of horizontal units the power house walls have to be extended up to an elevation above high-water mark. In order to make the walls safe it usually requires tremendous reinforcement and

heavy thickness of walls, all of which means great expense to the development.

(3) *What really happens in the " pitting " of the runner?*

The question has never been settled as to just what really causes a runner to pit. My preferred theory is usually referred to as the " nascent oxygen theory." By this I mean that when the water passes between the vanes and is discharged from the runner the pressure on the water is suddenly relieved. At the moment of this relief of pressure oxygen separates from the water. When the runner vanes are shaped so that there is a chance for the water to leave the back of the blade the nascent oxygen evidently collects in that space, and eats the material of the runner, producing the pitting referred to. Another theory is that of electrolysis, but that does not fit in very well with the fact that the runner only pits in places where a vacuum or pocket can occur.

(4) *Question as to whether the statement in Mr. White's paper as to the number of men replaced by the new 70,000 horsepower unit at Niagara Falls referred to 1,500 men altogether.*

The statement meant 1,500 men altogether, that is, 500 men per shift.

(5) *Within what limits can the head vary without seriously affecting the efficiency of a turbine?*

A variation of 10 per cent in the head either up or down from the normal will cause only a slight variation in the efficiency, the speed being kept constant.

If the speed were allowed to vary and to be fixed at will, the same efficiency could be obtained at the upper and lower limits of head. With the majority of units you can have a 20 per cent decrease in head and a 50 per cent increase in head without materially affecting the efficiency of the runner. In fact, on most runners the change in efficiency would not be more than 2 per cent.

(6) Question as to the possibility of impulse wheels with vertical shafts for very large units.

Yes, it is possible to build impulse wheels of the vertical type of large power with good efficiency. The double overhung horizontal impulse unit has received such an impetus in the West and it is so much in favor there that the vertical unit has not had its proper share of attention. The large vertical impulse wheel is a development which can be expected to come to fruition in the near future.

(7) How can the economic number of wheels for a given total horsepower be determined?

There are two features to be taken into consideration. The first one is that of necessity of the case, and the second that of efficiency. Discussing the first, we may say that if the proposed installation is to have no connection with the larger system then the total development should be divided into sufficient number of units so that with one out for repairs the others will take care of a greater portion of the load. When, however, the proposed development is to form one unit only in a large system then the question becomes one of consideration of efficiency and economy. Large developments are now being made of one unit, and that single unit development is considered merely one unit in a system.

(8) Question as to why the tunnel was cheaper than the outside pipe construction would have been in the case of the Niagara Power Company development.

The Niagara Falls power house referred to in this paper is located at the bottom of a vertical cliff. If the outside plate steel pipes are used it is necessary to bring the water up to the face of the cliff, install there proper head works, then carry the penstock down the face of the cliff. The Government requires rubble concealing walls to be placed around and about these pipes. These walls are also necessary to protect the face of the cliff from spalling off. The tunnel is shorter because it is the

hypotenuse of a triangle whose sides are a horizontal canal and the vertical penstock. The inclined tunnels are of such size that the rock can be excavated at minimum cost. As a matter of fact, the tunnels are stoped similar to mining work, which as you know can be done at very reasonable cost.

IMMIGRATION AS IT AFFECTS THE LABOR SITUATION

BY HON. W. W. HUSBAND *

(Presented before The Affiliated Technical Societies of Boston, November 26, 1923.)

INTRODUCTORY REMARKS BY ALLEN HUBBARD AND
COL. CHAS. R. GOW

MR. HUBBARD:† For more than three hundred years the people across the water have been looking at our country with longing eyes. At first a few of the bravest and broadest minded came over, and then they came in ever-increasing numbers. One of the obstacles to their coming is the passage money. It entails a great deal of labor and saving before they can get it, but they are willing to do anything to get it. There is a story of a thrifty Scot who saved and saved, and finally he landed in New York. There a diver emerged from the water, clambered up a ladder and was relieved of his helmet. The Scot looked at him for a moment in amazement and then he remarked, — "Hoot, mon! If I had known that trick I'd ha' walked miself."

Believing that the question of immigration is one of the most important questions before the country, the Council has selected that topic for this evening. Projects well done are best carried out by men who are familiar with the work to be done. I am therefore going to turn this meeting over to a man who in his work as President of the Associated Industries of Massachusetts, and other activities, has been brought face to face with this problem and is very familiar with it. I am going to turn it over to a man who, while like perhaps most of us he is not always down the very middle of the golf course, is always on the job, — Colonel Charles R. Gow.

COLONEL GOW:‡ I am not certain that I understand clearly the particular reason for inflicting upon you my presence in the rôle of presiding officer at this function. It is barely possible that your chairman has cleverly arranged the matter for the pur-

* United States Commissioner General of Immigration.

† Chairman, The Affiliated Technical Societies of Boston.

‡ Consulting Engineer, 957 Park Square Bldg., Boston, Mass.

pose of demonstrating how much worse you may fare than when he himself presides.

A story is told of a gentleman who requested his attorney to draw his will and who insisted upon the insertion of a provision that all of his property should go to his widow only upon the condition that she should remarry within six months after his death. Upon inquiry by the attorney for the reason of such a most unusual request, the client replied that it was going to be a great source of comfort to him during his remaining years to know that after his death there was going to be at least one man who was sorry he was gone. Possibly it was with some such thought in his mind that Mr. Hubbard was prompted to invite me to preside in his place tonight.

The immigration problem as it affects our country has become a source of more or less general interest but one nevertheless of relative vagueness in the mind of the average citizen. A business man who was recently asked what he thought of the immigration question replied, "It's a mighty good thing, I'm for it." Almost every one appears to be for it in much the same manner, but they experience difficulty in describing the specific action they favor regarding its solution.

This question has now become a matter of much public concern. Some people do not fancy a particular class of foreigners; others object to any foreigners at all. I recall a story of a father who said he didn't propose to have more than three children because he had read that statistics proved that every fourth child born into the world was Chinese. That indicates the fallacy of relying too much upon statistics unless you understand them. I remember also a student who undertook to write a thesis upon the subject of matrimony in co-educational institutions. He sent questionnaires to all the co-educational colleges, but received only one reply, which came from a college having one hundred male and only two female students that year. During the year one of the male students had married one of the young women, and this being the sum total of his information he reached the remarkable conclusion that it could be proved by statistics that in co-educational institutions one per cent of all the men married fifty per cent of all the women.

Speaking seriously, however, the question of immigration does intimately concern you and me both as citizens and as technical men. It affects us perhaps more than we realize, particularly in one respect, — that we must have some one to do our manual work. The native-born American has, through the processes of evolution and development in this country, become more useful in the advanced stages of industrial effort than in the capacity of common laborer. We are accustomed to depend on the alien for the latter service. Most of you are closely identified in one capacity or another with the productive element of society, — either in aiding or directing it. We are largely responsible as engineers and technical men for the development of the industrial machinery and methods of the country. If, then, there is to be a restriction on the further importation of labor supply, because of what appears to be sufficient reason, the job belongs to the scientist and to the engineer to devise the necessary labor-saving machinery, etc., which is necessary to offset the shortage. We must go on producing at an ever-increasing rate. Not only is our population increasing, but likewise our standard of living, and these necessitate an ever-increasing volume of production which must come through greater industrial effort or efficiency. The scientific men are very much interested in being apprized of this situation and in learning how they are to aid in supplying this need. If it is not to be accomplished by man-power then it must be achieved by machinery. So it comes down to the fact that the immigration question intimately concerns us, and it seems to me your Executive Committee has done well in selecting such a topic for the meeting tonight.

The speaker this evening is one of those men too rarely found in our American form of government who fills a public office as a demonstrated expert. We could have no better fortune, if we are to hear this subject discussed, than to have him advise us concerning the practical problems and details involved.

The gentleman who is to address you is no stranger to New England. In fact, he is a native of that district. Not of our own State, to be sure, but of the neighboring State of Vermont. He attended St. Johnsbury Academy at the same time as Calvin Coolidge. Whether the influence of that situation was more

beneficial to him or to the President, I have no knowledge. Undoubtedly both responded somewhat favorably to the acquaintanceship. Also in his early days he participated in newspaper work with another distinguished American, Colonel Harvey, recently relieved from the Ambassadorship to England. Perhaps here again there may be doubt as to which profited most as a result of their association.

About twenty years ago Mr. Husband was taken to Washington by Senator Dillingham, then Chairman of the Senate Immigration Committee, as his secretary and Mr. Husband was thereupon made Secretary of that important Committee. Twenty years ago, therefore, he began his study of this problem, and since that time he has been more or less closely identified with it. In 1907 President Roosevelt appointed him secretary of an immigration investigating committee. During the war he went with the Red Cross to Europe in connection with prison relief work. He has in recent years traveled through Russia, the Balkans and Turkey investigating immigration conditions, and for the past two years he has served as Commissioner General of Immigration in the Department of Labor at Washington. So he comes to us not as a novice but as an acknowledged expert, thoroughly grounded in all of the practical details pertaining to the immigration problem. This problem is not one to be disposed of by the man in the street offhand. It presents some very complicated technical aspects, and it is information such as Commissioner Husband can give us that we require if we are to understand it intelligently. So I feel that we are under a deep sense of obligation to him for coming here tonight, and it gives me great pleasure to introduce to you Commissioner General of Immigration, W. W. Husband.

HON. W. W. HUSBAND

That was the most generous introduction I have had in a long time, but it puts me in a difficult position, and it reminds me of an old story. A small boy was given a chameleon by his aunt, who explained to him that it would change to the color of whatever object it came in contact with. So he put it on his blue suit, and it turned blue; on his mother's gray dress, and it

turned gray; on his brother's red necktie, and it turned red. Then he put it on his sister's plaid golf cape, and the darn thing "bust up" trying to make good.

Speaking of President Coolidge, — a friend of mine called on the President the other day and was asked where he was from. He said, "Vermont." The President's only comment was, "You'll never get over it." That is probably true of most Vermonters.

I know that I ought to say, "I am glad to be here." And that is true, I am. But I don't want to go to the extent of saying that I am glad that I am here to make a speech, because I am not. I do feel gratified, however, to have Colonel Gow present, not only to introduce me but to listen to me, because, as he said, he has listened to me once before. I count that a genuine compliment.

I went to Washington from a newspaper office in Vermont some twenty years ago to become Clerk of the Senate Committee on Immigration. I had written one or two editorials on the subject of immigration and after the fashion of newspaper men had settled it to my own satisfaction. It seemed a very simple problem to solve on paper. After reaching Washington and going into the work of the Committee, however, I soon found that it was more difficult than I had supposed, and after dealing with it during the greater part of the time for the past twenty years I am frank to say I feel I am less able to solve it than I was twenty years ago. It is a very difficult question, — so many-sided, so many interests involved, — that one turns from one thing to another, and counter-currents, counter-interests, counter-emotions are constantly intruding, thus making it one of the most difficult of all public problems.

The Chairman spoke of three hundred years ago as the beginning of immigration to this part of the world. It is true that the immigration problem, so far as New England is concerned, began when the second shipload of colonists came to these shores. One of the promoters of the "Mayflower" enterprise, writing of the group that followed the Pilgrims, said they were "in all appearances not fit for an honest man's company." And so from the beginning those who came to the New World, together with their descendants, have stood upon the shores and viewed with

apprehension those who came afterwards, evidently in the belief that many of them had no other purpose than to tear down the civilization which the fathers had established. Thus it has continued through three hundred years, and it is much the same to-day as it was in those early days of Plymouth.

There was early legislation on the subject of immigration. Plymouth colony in 1636 enacted a law to the effect that no community should entertain a stranger for more than three weeks without the consent of the authorities, the stated purpose being to prevent the coming of those who would create political discontent or would become a public burden. And that simple act of the legislators at Plymouth is the basis of our general immigration law today.

Somewhat later the Rhode Island colony, which was founded as a refuge for the oppressed, seemingly believed that the oppressed were inclined to become the oppressors, and enacted a law placing a heavy fine on the master of any vessel bringing strangers to the colony from sources other than the British Isles, Guernsey and Jersey. That was evidently an attempt to select desirable immigration by first selecting desirable sources. That is precisely the principle on which the much-talked-of quota limit immigration of today is based.

The new Republic struggled along for nearly one hundred years with the doors swinging wide open to all classes and conditions of men from every part of the world. Indeed, all the Federal legislation on the subject up to 1882 was for the benefit and comfort of the aliens who came. The Passenger Act of 1820, which underwent several revisions, was designed to improve steerage conditions, and, in fact, legislation unfavorable to immigration and the immigrant, although frequently proposed, was long delayed.

In 1864 an act was passed to stimulate immigration. The country was at war, and man-power was needed for the factories and farms in the North to take the place of those who had gone to the front. The law seems to have worked badly from the beginning. Traffickers in foreign labor were quick to take advantage of the law and apparently there was much exploitation. In 1866 the appropriation for carrying on the work was with-

drawn, and the law was repealed in 1868. That was our only attempt to encourage immigration to the United States.

In 1882 two important laws were enacted, — first, the Chinese Exclusion Act, which has continued practically in its original form until the present day, and was the beginning of Asiatic exclusion, which has apparently become a fixed policy on the part of the United States. In the same year a general immigration law was passed, excluding from the United States four classes of aliens — idiots, lunatics, criminals, and persons likely to become a public charge. That was the beginning of our selective immigration policy. That law has been revised and amended several times, until, under the act of 1917, about thirty distinct classes of physical, moral, mental, or economic undesirables are excluded. But all of the time there was no limit placed upon numbers. All who met the tests the various laws imposed were free to come, and with the increasing severity of the immigration law came a constantly increasing number of immigrants who were admitted under it. There was no limit whatever so far as numbers were concerned.

However, for a good many years prior to the outbreak of the World War there was a strong and growing demand for the actual restriction of immigration, but the strength of the movement in Congress and out of Congress was not based primarily on the fear of numbers but rather on the changed character of our immigration that had resulted from a rapid and radical change in the sources from which the great majority of the immigrants came.

In 1882, the high-water mark of immigration in which northwest Europeans predominated, 72 per cent of all our immigrants were of northwest European stock — peoples we have come to call "Nordics," although strictly speaking some of them are not Nordics.

In this same year, 1882, less than 11 per cent of our immigrants came from southern and eastern European countries. In 1907, twenty-five years later, the old-time immigration had dwindled from 72 to less than 18 per cent of the total, while the new immigration movement had increased from 11 per cent of the total in 1882 to more than 76 per cent in 1907. The numerical in-

crease in this new movement was from 85,000 in 1882 to 980,000 in 1907. It was this remarkable change in the racial character of our immigration which for twenty-five years or more was the real basis of our immigration problem. During much of this period it seemed apparent that Congress was trying to find some method of materially checking this new immigration without at the same time placing barriers in the way of a normal movement of the old-time stock from north and west Europe. It was a very difficult problem to solve. For a good many years the literacy test was advocated by those who favored restriction. Somewhat more than a third of the new immigrants were unable to read, while illiteracy was at a minimum among those who came from northwest Europe. Accordingly it was believed, or at least hoped, that the exclusion of illiterates would in some measure bring about the desired result. The literacy test was finally adopted in 1917, but it came during the war and therefore was never fairly tried.

After the war returning travelers brought stories of enormous numbers of war-stricken peoples in the southern and eastern European countries who were only waiting for means of transportation to bring them to the United States. My predecessor, Mr. Caminetti, made a trip to Europe and startled Congress by predicting that many millions wanted to come. Congress was clearly alarmed at the situation, and in December, 1920, the House of Representatives passed a bill suspending all immigration for a certain period, and there were only 42 votes against it. The Senate was more conservative and turned to the Dillingham Per Centum Limit Plan, which had been proposed some years before, as a possible means of solving the post-war problem. Congress finally passed a per centum limit bill, but President Wilson pocket-vetoed it during the last days of his administration. However, it was quickly re-enacted at the special session of Congress which followed, and with President Harding's approval it became a law May 21, 1921. Thus Mr. Harding was the first of our Presidents to approve legislation which actually restricted European immigration to the United States.

Briefly, the provisions of the quota limit law are: That the

number of aliens of any nationality who may be admitted to the United States in any fiscal year shall be limited to 3 per cent of the number of persons of like nationality who were resident in the United States as shown by the Census of 1910. In other words, if in 1910 there were resident in the United States 100,000 persons who happened to have been born in some particular country, then 3 per cent, or 3,000, natives of that country could be admitted in a fiscal year. The quota limit law has been spoken of as purely emergency legislation designed to meet an emergency arising after the war. At the moment it was adopted it was an emergency measure, but it was not so designed, and when originally presented to Congress by Senator Dillingham, long before the World War, it was based on the theory that while it might be possible to assimilate a fixed addition to the alien population of the United States it was utterly impossible to assimilate an unlimited addition.

In 1914, the last normal immigration year, for example, the number of Greeks admitted was 36 per cent of the number already here — a very considerable addition. In the same year the number of Italians equaled 21 per cent of those already here, and immigration of various other peoples reached a high proportion of the number of such peoples already in the United States. And so the law was not, as I have said, strictly an emergency measure, but, rather, it had a logical basis in that it was intended to admit into the United States only such a number of aliens as could be assimilated into the population.

If I may refer to statistics for a moment, Colonel Gow, let me say that the average annual immigration from southern and eastern Europe for a considerable number of years prior to the World War was approximately 750,000. Under the quota limit law this was reduced to 156,000, or about one-fifth of what the normal number was before the war. On the other hand, the number of Nordics who may come — nearly 200,000 in a fiscal year — is somewhat larger than the average annual immigration of such peoples prior to the World War. So in that respect the law has fulfilled the purpose of Congress in cutting down immigration from one part of Europe without interfering with a normal movement from the other part, and in accomplishing this

it has perhaps done more than can be said for some other repressive laws of recent origin.

The administration of the law has resulted in hardships, and I think perhaps the country has been made acquainted with the *hardships* that have arisen under the law rather than with the benefits that have come from it. There have been stories of children torn from their mothers' arms and deported; stories of separated families, because one member chanced to be born in a country which didn't have a quota and another member in a country which did. Such stories have been current news for two years, ever since the law went into effect. There have been hardships, but nothing of that sort has been done if it could possibly be avoided. Commissioner Johnson of the Boston Station is here tonight. No doubt some of you know him, and if you can imagine him tearing a baby from its mother's arms and sending one or the other back across the ocean, then perhaps you can imagine that some of the stories that have been told are true.

But our troubles have had a humorous side too. There is one story of a rather prominent colored man from Liberia who applied for admission. He was held at Ellis Island, not on account of the quota but for a totally different reason. The quota had nothing to do with it. But in those days everything was charged to the quota law. So that the story was broadcasted that the quota for Liberia for the remainder of the month was one-half of a man, and that considerable difficulty was being experienced as to just what to do with the applicant. There was talk of a surgical operation, but finally one bright newspaper man discovered that he was coming to join his half-brother, and being a half-brother he was only half a man any way, and so might be lawfully admitted.

But the law, as I have said, has worked. In 1907, I pointed out that only 17 per cent of our European immigrants were from Nordic countries. In the fiscal year ending June 30 last, however, 63 per cent of the people of European stock coming into the United States were of the Nordic races, and during the present fiscal year the proportion promises to be even larger. Clearly this revival of the old type immigration is another evi-

dence that the quota law has accomplished what it was intended to accomplish. Up to 1882, or even 1890, the Nordic countries furnished practically all the foreign labor in the United States, but the movement declined very rapidly when the new type immigrants came in large numbers. But there is every indication that if the quota principle is continued the Nordic peoples will again come into American industry as they did in earlier days. Indeed, it now seems apparent that the fixed quota limit of 200,000 for the present year is the only thing which is standing in the way of the largest immigration from northwestern Europe for thirty, or perhaps forty, years. It seems evident that the number who would come from these old sources, if permitted, would be at least 400,000 this fiscal year, and possibly even more than that.

Up to this time my talk has been very much like all immigration talks, about the quota law, — an explanation of what has happened. It has been a good deal like the boy's comment on his father's sermons. A fellow student who was struggling desperately to write an essay and was not making very much headway said to the minister's son: "I don't see how your father manages to write fifty-two different sermons a year?" "My father doesn't write fifty-two sermons in a year," replied the boy. "He preaches the same sermon over and over, and just hollers in different places." That is quite typical of immigration speeches generally.

It is stated in the program that I am expected to speak on "Immigration as Affecting the Labor Supply," and here you get into one of the most difficult phases of the immigration problem. I may say frankly that I hesitate to talk on this subject to a body of engineers who have to do with labor, for of necessity my viewpoint is largely theoretical. On the other hand, I would be exceedingly glad, as an administrative officer, to have you tell me from your experience how the quota law is affecting the labor supply. We in Washington are sometimes accused of thinking that we know all about a public problem. But the fact is if an administrative officer wants to know how a law is working out he simply has to go among men who are experiencing its practical effects. He cannot get this angle sitting at a desk in.

Washington. Therefore I am glad of the opportunity to talk, not *to* you but *with* you, tonight, about the effect of this very radical immigration law on American labor and American industry.

The extent to which immigrants, foreign-born, and in particular the groups referred to as the "new immigrants," had invaded America prior to the World War was investigated by the Immigration Commission. It made a very exhaustive study of all the principal industries in 1908-1910, and in twenty-one of the leading industries it was found that about 60 per cent of all the employees — not only common labor but all employees were foreign-born. In clothing more than 72 per cent, in soft coal 62 per cent, and in sugar refining 85 per cent were foreign-born. That, of course, indicates that the immigrant — the foreigner — has played an exceedingly important part in the development and maintenance of American industry. And now the question naturally arises (it has been asked a great many times in the past two years): Is it possible for American industry to go on as it has gone on in the past under a highly restrictive immigration law? Chiefly, I think, the call has been for unskilled labor. The plea has been: "We need to import unskilled labor. The American will do the skilled work, but he never will do the unskilled. Consequently the doors must be kept open to southern and eastern Europe, which supplied the men who have done such work for us for the past twenty-five years or more." I don't know whether that point of view is generally accepted or not. It is believed by some persons. I know others, however, — employers of labor, too, — who believe that it is possible to get along without an unlimited supply of cheap labor, and that the same results can be accomplished in some other way. I speak of "skilled" and "unskilled" labor, but isn't it a fact that "skilled" labor, except in a few industries, has come to be almost a misnomer?

Recently I went through a hardware plant in Connecticut where some 4,000 or 5,000 people are employed, and I looked especially in one department after another to see something that resembled "skilled" labor — old-fashioned artisanship. The only thing that I saw that came anywhere near being skilled labor was where some men were engaged in repairing machinery. The rest

of the work consisted simply in "feeding in," and machines did the work which in a similar industry forty or fifty years ago would have been very largely done by hand. That is true, as we all know, of nearly every industry. Machines developed through the inventive genius of the American people have almost eliminated the old-time skilled labor. We have been very charitable in referring to this sort of machine work as "semi-skilled" labor. It is hardly that in most instances. It is labor that any one of reasonable intelligence could do with little training. So if only actual skilled occupations were left to the native American there wouldn't be very much open to him in present-day industry.

On the other hand, much labor which was formerly unskilled has, by the introduction of machinery, become skilled or semi-skilled work; for instance, in breaking up the pavement of a street and cleaning away the broken asphalt. Formerly this was purely unskilled work, and considerable of a job. But now a machine breaks the paving into pieces, and a steam shovel comes along, picks up the pieces, loads them into the truck, and the paving is gone. Practically every operation of that method needs skilled labor. There is the man who runs the breaker and the man who runs the steam shovel. Both occupations are skilled labor. So what was formerly hard pick and shovel work and what was formerly skilled artisanship are both done by machinery. We have not yet reached a dead level in the matter of skill in industry, but machinery has certainly taken us a long way in that direction.

In Connecticut the other day an employer said that the chief difficulty with the situation was that common labor is now demanding wages almost equal to that of the so-called skilled laborer, or machine operator. Well, I don't know any reason why there should be a great difference in that respect in view of the leveling process that has followed the development of labor-saving machinery. About the most consistent advocate of immigration restriction I have seen is a man in New York who is the developer of labor-saving machinery. He was for continued restriction, of course, because his business has prospered as never before since restriction came.

The head of a big steel concern told me recently that he believed we could get along without so much common labor. In his plant, employing perhaps 5,000 people, he said they had 600 fewer common laborers than in 1914. They couldn't get sufficient labor during and since the war, and so set about finding other ways of doing the work. In the old days, he said, many laborers were employed in handling stock which is now done with magnets and mechanical carriers. In this and other ways the plant had developed so that it dispensed with 600 unskilled laborers, but it is doing the same amount of work as before, and doing it cheaper, too.

The Immigration Commission reported that before the war there was clearly an oversupply of common and so-called semi-skilled labor in the basic industries. This conclusion was challenged hotly. The fact was, however, that there was so much labor in the basic industries at the time that the average big employer did not have to adjust his program to a labor supply, for unlimited immigration usually furnished all or more than he needed. If a plant wanted 5,000 men for the peak months of the year, they were there, even if it didn't need more than 4,000 during the rest of the year. The immigration from southern and eastern Europe lent itself very readily to that sort of thing.

The Commission learned the income of a good many thousand wage-earners who were heads of families, and found that while their indicated wage, that is, the rate per day or per week, was fairly good, being upwards of \$700 a year, their actual earnings were only about \$400 a year. You can't expect an American boy to go into a job of that kind, nor can you expect immigrants of the Nordic races to do so. But that \$400 a year was so much better than anything the new immigrants had ever dreamed of in their home lands that they accepted it readily and uncomplainingly. They had introduced a new standard of living into American industry; however, and while it may have been a higher standard than they had enjoyed in the lands from which they came, it was so very much lower than what we are pleased to call the "American standard" that American and Nordic families could hardly be expected to compete with the new immigrants as wage-earners in American industries, and they didn't.

Now I have said that the Immigration Commission found there was a great oversupply of labor in the basic industries of the United States at the beginning of the war, and that this statement was challenged. But I think when we consider the development of industry in the United States during the war we will hesitate to dispute the Commission's verdict. The restriction of immigration didn't begin with the enactment of the quota law in the spring of 1921. It came with the opening of the World War in 1914. The influx dropped from 1,000,000 European immigrants in 1914 to 145,000 in 1916, and 31,000 in 1918, so that immigration from that source was practically shut off. In addition, a great many of those who were here went back to engage in the pastime of war at home. In 1917 and 1918 we called to the colors 4,000,000 young Americans, a great many of whom were in industry, to follow destructive rather than productive occupations. And yet if you look at the Government records, the increase in production along nearly all lines during those years was marvelous. I won't attempt to quote the statistics except to say that whereas in 1914 there were 8,200,000 persons recorded as engaged in industrial occupations in the United States, in 1919 there were 10,800,000, notwithstanding the fact that there was no immigration, and that we had taken 4,000,000 young men out of industry. Where did they come from? The answer might be that a good many women went into the industries and that many young boys left school and went to work. That, however, doesn't account for the enormous increase in production. The simple fact seems to have been that America, under the inspiration of war, took off its coat and went to work as it had not for many years before. The crude steel output increased from 23,000,000 tons in 1914 to 34,000,000 in 1919; and the amount of iron ore produced increased from 39,000,000 to 56,000,000 tons in the same period; the number of spindles in woolen mills from 986,000 in 1914 (there were 22 per cent idle in that year) to 1,633,000 in 1919. Somebody was doing the work. And so it went in practically all of the industries.

Have we a labor supply without drawing so heavily upon Europe? This war experience naturally creates a doubt as to what is a normal labor supply. The revival of industry during

the past two years has brought about a demand for labor. This has been particularly conspicuous in the building industry. But I wonder if there was a real shortage of labor in that industry. Most of the talk, you will remember, came from New York. But you who are connected with the building trade know that what New York has tried to do was to put over a two or three years' building program in six months. The wages of carpenters, painters, plasterers, bricklayers, all of the artisans employed in the building trades, even common labor, went to unheard-of rates. Was it due to a real shortage of such labor or was it due to the fact that New York and some other cities were trying to do something abnormal? There was a demand also in steel and in some other industries, but at the same time there was, and is still, an oversupply of labor in some other industries, — bituminous coal, for example. It has been estimated that if all the men engaged in mining bituminous coal were to work a normal number of days each year they would mine so much soft coal in excess of the existing demand that all of the loading facilities in the seaports from Galveston to Portland, Maine, couldn't load the surplus on ships for export provided there was an ample foreign market. Of course bituminous coal mining has become to a considerable extent a seasonal industry, but does not an oversupply of labor in almost any industry tend to create a like condition?

Last year we received 117,000 immigrants from Canada. That is not quite fair, for the Dominion is striving to encourage immigration and all admit that her great need is for an increased population. Mexican immigration is increasing. Last year more than 60,000 were admitted from that country, and they are to be found in industrial establishments as far east as Pennsylvania. That is another rather discouraging feature of our immigration situation.

I thank you very much for the opportunity of discussing this problem in this random sort of way. I do not believe that Congress is primarily concerned with numbers. In other words, if immigration is of the sort which has demonstrated its ability and desire to become thoroughly American, and can be depended on to assimilate with the American people, I do not believe there

would be great objection if the quota were a little larger for that particular kind of people. I presume that it is quite commonly believed that the desire of capital for cheap labor is all that prevented the adoption of a restrictive immigration policy long before the quota law was enacted. In my opinion, however, that delay was due not so much to the desire of capital as it was to the old American feeling that the United States ought to continue to be a refuge for the oppressed.

I have talked rather at random about these matters, and there is only about a minute of my time left. I think Colonel Gow wants to leave some time for further discussions, and that would be exceedingly pleasing to me. If I have expressed ideas that are wrong from your point of view, or if you have any solution of the immigration problem which I, as an administrative officer, can communicate to the committees of Congress, I shall be glad, for we are always called on for suggestions of that sort. I have known men in Congress who could get over every other barrier to severe restriction of immigration until it came to closing the doors to the oppressed of other lands, and there they failed. But having abandoned the ideal of America as a refuge, and that is what happened when the Dillingham law was enacted, there is little probability of a return to the open-door policy. Future laws may be more liberal than the present one, but it seems safe to predict that whatever is done, the guiding star of the Congress will be the welfare of America and the perpetuation of American institutions.

I have made three speeches today, and perhaps you will think I ought to know when to stop, but having got started it is rather difficult to do it. I think just at the present moment I am somewhat in the predicament of the young Swedish fellow who took his best girl to ride. He was bashful, and so was she. They rode for about half an hour and not a word was spoken by either one. Finally, he, more in a tone of asking information than of making any definite proposition, said to her: "Hilda, would you marry me?" She responded so quickly in the affirmative that it quite startled him. So there was silence again for sometime. Finally Hilda said: "Aren't you going to say anything more about that?" And Hans replied: "I guess I've talked too darn much already."

Discussion

COLONEL GOW: Mr. Husband has very kindly expressed a willingness to answer any questions any of you may have in mind respecting immigration.

QUESTION: I should like to ask whether Mr. Husband regards the southeastern European races as inferior to the Nordic?

MR. HUSBAND: That is not a fair question, because I don't think any one does. Certainly no one who has had to do with immigrants, or has had to do with Europe, would ever take the position that any one people are inherently inferior to any other people. They undoubtedly have different ideals and different political thought. Possibly inferior, possibly superior. It is not for me to say. But I will say this, that even the American digestive apparatus which a few years ago we believed would digest or assimilate anything has seemingly failed to make any great impression on large numbers of those who are here. They are still a minority, or, rather, a group of minorities. There are many differences — social, political, economic. I am not saying that they are better or worse, inferior or superior, but simply that they are not mixing.

QUESTION: Do you think that the people of the United States generally have the same feeling and attitude toward the Japanese that the people of the Pacific Coast have?

MR. HUSBAND: We have here tonight a Japanese expert, which I am not, and I have asked Colonel Gow to call on Dr. Clark to tell you something about the oriental situation.

COLONEL GOW: I had in mind to ask Dr. Clark a little later if you don't mind waiting.

QUESTION: May I ask what the European attitude is toward our restrictive immigration?

MR. HUSBAND: I do not know that as a rule European countries have any clearly defined attitude on the subject. Italy, however, forms an exception, and her attitude is no secret. Italy in the past has depended as much on the export of man-power as has Alabama on the export of cotton. Italians have gone abroad in large numbers, earned large amounts of money, and sent large amounts back to the home country. It was said some

years ago that emigrant money from America was the only thing that enabled Italy to maintain the gold standard. In the past Italy has raised more people than she needed and it was an economic necessity to export them.

From the selfish viewpoint, the interests of the emigrant-furnishing country and the immigrant-receiving country are, in the very nature of things, diametrically opposed. The country which loses through emigration very naturally might want the worst to go, while the receiving country wants only the best. Some countries in Europe frankly want to get rid of certain peoples, and since the quota law went into effect there have been indications that certain countries rather facilitated the departure of some classes of the population and perhaps hindered the departure of others. But I think the countries of Europe are exceedingly fair on the whole. There is a population pressure in a good many countries in Europe now — more people than they can readily take care of, that is, furnish profitable employment to. They are reluctant, perhaps, to lose their people, but under the circumstances they seem willing that they should come.

MR. JOHN GRAY: I am an immigrant myself, and I don't belong to this association, but I read about the meeting in the newspapers and had a lurking suspicion we would have the engineers maintaining we should have unlimited immigration on account of the high wages which are being paid in the building trades right now. I find the speaker has not advocated unlimited immigration so far. Some few of his last remarks, however, seemed strange to me. For instance, that in this country people cannot furnish employment. I thought that employment was not furnished by anybody. I thought that the workers were employed because it was profitable to employ them.

Some thirty years ago in Great Britain there was unemployment and they commenced to make trouble, and they sent a deputation to Lord Salisbury, then Prime Minister, and he made the remark: "Emigration is our safety valve." In other words, when the unemployed become so numerous that they are dangerous it is a good thing to get rid of them somehow. Today there is the same thing in England. When Lloyd George was getting recruits he promised after the war to make England a

fit place to live in. I have a young son there now who says, "It takes a hero to live in it now." This smart little Welshman told them the only thing for them to do was to emigrate. Now if there is an unemployed labor problem over there and we have unlimited immigration over here they will force the same problem upon us. They will intensify our labor problem and also our rent problem. To my mind, every shipload of immigrants enhances land values and raises rents. There is greater competition for employment and increase in rent. While I have been an immigrant myself I believe now upon insisting on the safety-valve idea, and I believe in keeping the people back and letting them settle their own economic problems at home. I don't want them to come here and make another for us. We are having a little prosperity just now. But I have been through this before, — days of prosperity and then days of panic. If I had known as much then as I know now I'd never have come at all, but have stayed at home and preached discontent, and pointed the way to some other manner of settlement. The cry is: "Get rid of them!" "Send them to create a new problem in America." I believe, with the old-time Americans, we don't want these people here. If this is strictly a free country we want neither bolsheviks nor socialists. Every immigrant makes it worse for those already here. I have always had a suspicion that it was "bad business," as Teddy Roosevelt would write, to favor unlimited immigration.

MR. HUSBAND: You were here when I told the story of the minister's sermon? Yours was not unlike it. You only "hollered in different places." Now, I hope I don't give any one the impression of wanting to go back to unrestricted immigration. I don't think any one wants to do that. What you have said of the relieving of the troubles of Europe by emigration — the safety-valve idea — is true. When America abandoned the theory of the refuge, emigration ceased to be a safety valve. If you will go back over the history of emigration you will see how many problems of Europe, America has solved. Following the Irish famine — a purely economic problem — Ireland could have supported the eight million people she had if they had developed their resources, but the crisis came — a potato famine. And we

solved the problem by taking her people as immigrants, and they were good immigrants. A few years later when the German revolution failed, the revolutionists, liberty-loving Germans, didn't stay at home and fight it out. About a million came to the United States in the next ten years, and, consequently, we helped to solve a political problem for Germany.

MR. GRAY: If we could have shut them out wouldn't they have been more likely to have settled their own problem?

MR. HUSBAND: I honestly believe that if they had stayed in Germany and fought it out Germany would not have been the autocracy it was in 1914, and perhaps the World War would have been avoided. Those people were an asset to this country, but if they had stayed at home and fought for liberty the history of Europe in the last few years might have been considerably different.

QUESTION: I understood that there was an act, or a clause in an act, I think it was the Act of 1868, that "the right of migration was one with the rights of man."

MR. HUSBAND: I think that the right of emigration as distinguished from immigration, going out rather than coming in, has been very generally accepted by all civilized nations. I think Russia was, prior to the war, the only European country which sought to deny the right to its people to go beyond its borders. That attempted control, however, was unsuccessful. Practically every one who came from Russia to the United States before the war theoretically violated a law in so doing. Immigration into a country is another matter, and I believe that it is a cardinal principle of international law that every country shall have a right to say who shall come within its borders. I think that it is generally accepted that every nation shall have a right to say who shall come in, and that it is not necessary to give any very specific reason for keeping them out.

QUESTION: Was Mr. Shortridge right in saying that under this law Japan's quota would be somewhat less than are actually coming in at present?

MR. HUSBAND: Japan, as compared with European countries, is the "most favored nation" so far as numbers of immigrants are concerned. I think that in the past year the number

who came in under the so-called Japanese agreement was considerably above 3 per cent of those already here, while the quota of other countries is limited to 3 per cent.

QUESTION: Do you see any objection to enforcing the 3 per cent quota on Japan?

MR. HUSBAND: Not being a Pacific Coast man I don't see any objection. The Pacific Coast would probably object, but I see no reason why both Japan and China should not be under the quota limit law. In fact, I believe that a somewhat smaller immigration from both countries would result. There are too many loopholes in our immigration laws. For example, the general immigration law of 1917 enumerates some thirty classes of aliens who are denied admission to the United States. Then follow nine provisos telling how they may get in. An immigration law to be effective must be a hard and fast law, and limiting numbers seems to be the only sure way.

MR. EDGAR S. DORR: I should like to ask the speaker of the evening if statistics of naturalization would be a desirable index as a basis for a quota?

MR. HUSBAND: There has been serious talk of using naturalization rather than population figures as a basis for a new quota law, or for differentiating between peoples under the present law according to their tendency to become naturalized. A discussion of these projects would require too much time, but it is a fact that the people of practically all northwest European countries have a much higher naturalization record than those of southern and eastern Europe. The Welsh lead, with 73 per cent naturalized, and the Germans are not far behind. The Greeks are among the lowest of the Europeans, less than 17 per cent being naturalized. Of course it may be said that the new immigrant peoples have not been here as long as the others, but that argument is not conclusive when you consider that there was practically no immigration from those parts of Europe between 1914 and 1920, and that intense Americanization and naturalization campaigns have been in order. It must be admitted that some, and even a great many, of our European groups have made a rather poor showing in the matter of acquiring American citizenship.

MR. EDWARD P. WARNER: In connection with your statement that it is a recognized right of nations to decide who shall come within their borders and to give no particular reason for that decision, do you consider it to be feasible or practicable to put in practice the scheme of individual selection with a view to facilitating the entry of those apparently specially qualified by previous attainment or ability?

MR. HUSBAND: I think so, in this way. With restricted immigration, that is, immigration held within certain bounds, I do think there is a possibility of developing a system under which preference will be given to those who are the most needed in the United States. With respect to selection as to quality — that is another matter. There has been some talk of going abroad and handpicking our immigrants, so to speak. Well, possibly some of the nations might stand for it, but if foreign officials came here and began handpicking our people in that manner I can imagine that the enterprise would last about three months — if our people were not too busy to dispose of them sooner. We have no right to assume that other nations will stand for what we wouldn't stand for ourselves.

MR. WM. G. STARKWEATHER: I would like to ask your idea of the people already with us. Where does the colored man fit in? He is sometimes good for the higher class of skilled labor, and his loyalty has never been tested.

MR. HUSBAND: As a matter of fact the limiting of immigration during the past two years has been one of the prime causes of the very large negro migration northward. I do not know just the figures, but I know it has been very remarkable.

MR. STARKWEATHER: Four hundred and eighty-six thousand.

MR. HUSBAND: That is migration, however, rather than immigration or emigration. But if the better distribution of the colored people is beneficial, why the quota law has another accomplishment to its credit. There is another source of labor in the United States which I think has been largely overlooked and which might readily be the source of a large and exceedingly high-class labor supply. That is the partly employed, or unemployed, white people in certain parts of the South. If you are

acquainted with that region you will remember seeing small farms of forty acres or so, raising hardly anything but a little corn and a few potatoes; perhaps with a tall, strong father and a number of big sons who do practically nothing throughout the year except operate that little farm. The only thing that calls them out has been war. They came out in the Civil War and we know what kind of men they were, what kind of fighters. There was the great hero of the World War — Sergeant York. He was just that type of man. Some of the best blood that ever came into America is found in the southern mountains, and it seems to me that here is a neglected source of considerable high-class industrial labor. In its development of manufacturing the South is taking and will continue to take them into industry.

MR. JAMES CAMBION: I wanted to inquire what effect a tax on labor would have, that is, a tax on the employer of labor drawn from immigration? We have a protective tariff to keep out manufactured goods, but no tariff which will protect the workers of this country. I think there should be a tax to keep out immigrants, that is, to protect the American laborers.

MR. HUSBAND: Could that be done? It couldn't under the Federal government certainly, and I don't know whether it is feasible under the states or not.

MR. CAMBION: I remember when President Roosevelt came to Lowell and spoke he said he wanted protection for American labor that would get by the counting room, and I wrote and asked if he would favor a tax on the employer of New England labor, and some clerk replied that he would call it to the President's attention.

MR. HUSBAND: I don't see what protection that would be to labor. Rather, I should think it would be a burden on labor. Somebody would have to pay for it.

MR. CAMBION: I haven't the draft with me but it went something like this: "Any person, firm, or corporation, or association which employs an alien shall pay an excise tax equal to the wages paid such alien."

QUESTION: I heard that Secretary of Labor Davis recently made the remark that he wouldn't allow an immigrant to come here as long as an American laborer was out of a job. Is that true?

MR. HUSBAND: I don't know, I'm sure. I can't say.

QUESTION: In regard to these immigrants coming here and sending millions of dollars of money out of the country. Should that money go without letting it be taxed, 20 per cent taxed?

MR. HUSBAND: The question of the immigrant taking or sending his money out of the country, while perhaps unfortunate from one point of view, is, to my way of thinking, not particularly disturbing. In earning that money, in acquiring that money, he has created a sufficient amount of wealth, it seems to me, to justify him in doing whatever he pleases with it. If he has not created more wealth than his earnings represent, then the whole scheme is a failure and would fail of itself.

COLONEL GOW: I am going to call upon Dr. Clark now, if he will say a word to us at this time on the Japanese question. Dr. Clark, as you probably know, is the editor of the "Living Age," and was formerly Commissioner of Immigration at Hawaii. He is very familiar with the Japanese question, and we thought it would be particularly interesting to ask him to develop that phase of the problem.

DR. VICTOR S. CLARK:* I want to disclaim being an expert on Japan or the Japanese. I was Territorial Commissioner of Immigration in Hawaii for some years. We had the largest proportion of Japanese of any place under the American flag. The Japanese immigration question is interesting in this aspect, — that it is part of the world migration question of the future. The question of the future is going to be not so much migration between nations of the same race, as migration between colored population areas and white population areas. That is a question now straining the bonds of empire for Great Britain more than any other single question. And it is going to be our question. The people of California, being right on the skirmish line, so to speak, realize it and react to it. They feel the presence of the Japanese because the Japanese colonize more intensely perhaps than any other people who come to the United States. They do the same thing in their own country. Japan is a nation clustered along the seashore. The mountains and the interior don't have a large population. Hokkaido, the northern island,

* Editor, *The Living Age*, 8 Arlington Street, Boston, Mass.

is comparatively thinly populated though it has as good soil as Kansas or Nebraska. The Japanese prefer to live where they can grow rice or similar crops. In California they colonize along the Sacramento River and in places like that.

I have had a good deal of contact personally with the Japanese. I have had them in my employ. I like them. I have very good friends among the Japanese, and I don't feel toward them any differently than toward white men. Not a bit. Yet we have now in the West a feeling that has simply got to be reckoned with, and it is more or less a political problem for the whole country.

Commissioner Husband has told you something that the people of this country do not adequately realize, — that if we were willing to apply to Japan exactly the same quota law that we apply to Europeans we should get fewer Japanese than we do at present. Under present conditions, with the Japanese custom of picture marriages — where the ceremony is performed in absentia, and the woman comes as a "picture" bride — a large number are admitted. Before the war two thousand or even three to four thousand picture brides were coming into Honolulu annually. This led to very rapid growth of the Japanese population.

The Japanese do become Americanized. I have had Japanese boys in my employ whom I never heard speak of Japanese except as "those Japs." But where they are living in communities, and especially where they are ostracized from the schools, they naturally retain their nationality. Their condition calls for sympathy. I have had Japanese friends who have told me, "We are most truly a people without a country. We cannot go back to Japan and yet here we are constantly made to feel we are aliens." Many attend American schools and learn to read and write and speak English much better than they can Japanese. So we are facing a very difficult question, and one that at some time in the future may involve us in hostilities with Japan. We hope not. We hope to find a better way to settle such a question, but it is a very serious and embarrassing aspect of our international relations — this immigration problem out there on the Pacific Coast.

But it is only the first phase of a world problem. If we don't have competition from the Japanese and Chinese in this country we shall have it in Japan or in China. Three years ago I was told in Japan by an American representing one of our largest manufacturers of spinning machinery, that he had sold two years' output of his works in the Orient within a few months. That was during an unusual boom, to be sure. It was right after the war. However, we have got to meet the competition of the yellow man, if not in our own country in his own home.

So all these elements of racial competition are going to be one of the big future problems for us to settle. But it is a problem which takes us clear away from the topic tonight and I didn't come here prepared to speak upon it. If there are any specific questions about Japanese immigration which I am able to answer I shall be glad to do so.

QUESTION: I understand that if an immigrant has a wife, and has children born here, that child can be sent back to Japan, and that any Japanese resident can go back and resume Japanese citizenship, but if an American is in Paris and has a child born there that child is an American.

DR. CLARK: The practice in Hawaii, which may have been more or less arbitrary, was to recognize the American citizenship of every Japanese child whose birth was officially registered. Otherwise it was not recognized. All the Japanese register their children, especially if they have boys, as American citizens, so that they may have the right to take up land. Then, partly because they want to keep them loyal to Japan, they are sent to Japan to be educated, usually in their native village, until they are old enough to earn their living. Still, it isn't solely a desire to keep them Japanese that makes the fathers send them to Japan; it is partly because it costs about one-third as much to rear and educate a boy in Japan as it does here. And the Japanese is just as canny about money matters as a Scot.

QUESTION: I lived in Japan and traveled on the Pacific Coast. I like the Japanese. I saw them in their native life and I admire their artistic temperament, but I also saw the effect they produce on the Pacific Coast. Personally I don't think it advisable for them to come. I would keep them all out.

DR. CLARK: You see it like the average man in California.

COLONEL GOW: The hour is late and I think possibly most of you gentlemen have trains to catch. Before doing so I would like to ask if you won't give a standing vote of thanks to the speaker of the evening.

ACTIVITIES OF THE FEDERATED AMERICAN ENGINEERING SOCIETIES

THE ENGINEER AND THE SIXTY-EIGHTH CONGRESS

The engineer's place in public affairs was again emphasized in the keynote address, — President Coolidge's annual message to the Congress. Many references were made to the matters in which the engineers have taken an active interest. Outstanding among these were the demand for immediate action on the plan for reorganization of the executive departments, that the high-ways and reforestation program should have the continued support of the Government, and that public improvements on rivers and harbors, Great Lakes development, and the super-power system proposed for the Northeast be pushed by appropriate legislation at the earliest possible time. The engineers are already planning to again take up in an active and aggressive manner the reorganization of the Government as it relates to engineering matters. They are following closely provisions for proper highway development, and through a specially appointed committee they are actively co-operating with plans for reforestation and forest protection. They are following closely the development of river and harbor improvement work, principally because of its proposed inclusion in the Department of Public Works.

The Executive Board of the American Engineering Council gave consideration to the Great Lakes development project and the American Society of Civil Engineers is now giving further study to the essential facts, in the hope of assisting Congress in the proper development of this project. It will be recalled that the engineers were the prime movers in securing the original investigation of the super-power project and they are naturally most interested in seeing the consummation of a suitable plan. This is exemplified in Secretary Hoover's recent efforts to revive the interest of all of those who will be benefited by the development.

Other projects in which the engineers have been actively concerned and on which it will be recalled that President Coolidge

made special recommendations are: The immediate sale of the Muscle Shoals development by Congress on the advice of a small joint committee which will consider offers and conduct negotiations; vocational training for veterans; restriction of immigration; limitation of child labor; and a place for education in the Cabinet. Following the recommendation of Secretary Hoover, provisions for a suitable, self-sustaining merchant marine were urged upon Congress, and perhaps the most talked of recommendation was that concerning the consolidation of the railroads into a limited number of systems. Regulatory legislation was also recommended covering protection of our coastal waters from pollution, laws covering aviation, radio interference, re-codification of our navigation laws, and revision of procedure of the Federal Trade Commission so that it may have a more constructive purpose.

One of the President's most interesting references from the engineers' standpoint was to the coal industry, wherein he stated that the need was for better action under private ownership that will secure greater continuity of production and greater public protection. Recognizing the difficulty, such as intermittence of operation, he said that "distribution, storage and continuity ought to be improved."

The appropriation bills will undoubtedly be introduced shortly after the turn of the year and it is contemplated that the laws finally enacted will closely follow the Budget. Items in the appropriation bills of special interest to engineers will cover topographic mapping, reclassification of the technical and scientific employees of the Government, appropriations for the engineering bureaus and some of the special investigations being made by the Department of Commerce which are now of special interest to the engineers, such as the investigation of raw materials and the assistance to foreign trade.

A program will be presented to Congress authorizing one hundred million dollars annually for the next three years to develop Federal aid to highways in co-operation with the states. Eighty-six million dollars will be expended for the current year 1923, so that estimates of one hundred million dollars for the next three years do not appear to be unreasonable.

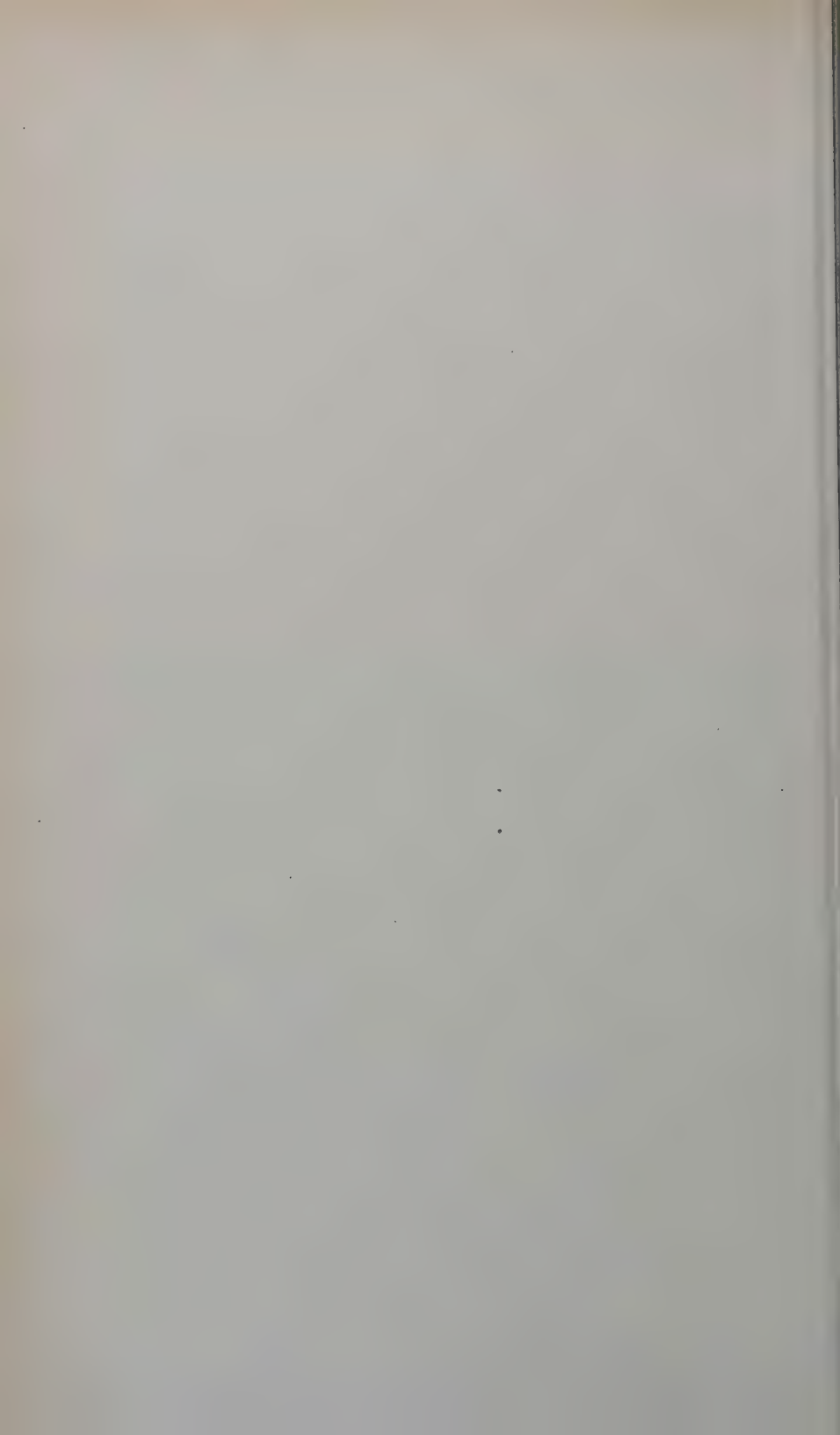
As a forerunner to the accomplishment of actual reorganization of the Executive Departments, it is expected that an executive order will be handed down at any time transferring the Bureau of Mines to the Department of Commerce. This can be done under the organic act establishing the Department of Commerce. Further, the Attorney General is working on the possibility of executing other transfers under this law. It is contemplated that hearings on the general reorganization plan will be started shortly after the first of the year.

Senator Oddie, the engineer member of the Senate and Chairman of the Committee on Mines, contemplates very active work during this session for his committee, in such work as revision of the mining laws, promotion of research in the mining industry, encouragement of metal mining, and the proposal for a Department of Mines.

The engineers' proposal for a national hydraulic laboratory will be pushed by Senator Ransdell, who is willing to have further hearings and to in any other way follow out the suggestions of Mr. John R. Freeman as co-supporter of the bill with the Federated American Engineering Societies. Senator Ransdell took the engineering course at Union College and is a staunch supporter of the engineers' program to assist in public affairs.

Coal legislation covering the recommendations of the United States Coal Commission is understood to be in form to present to Congress at an early date. Bills providing for an international conference on pollution of coastal waters and an appropriation of five million dollars for helium, reforestation legislation, amendment to the Webb-Pomerene Act, and several other bills have already been proposed.

It is clear that many matters of interest and importance to the engineering profession will be considered by Congress this winter and it is hoped that tangible results may be obtained.



BOSTON SOCIETY OF CIVIL ENGINEERSFOUNDED 1848

PROCEEDINGS

MINUTES OF MEETINGS

BOSTON SOCIETY OF CIVIL ENGINEERS

BOSTON, December 19, 1923. — A regular meeting of the Boston Society of Civil Engineers was held this evening in Chipman Hall, Tremont Temple, and was called to order at 7.45 P.M. by the President, Frank M. Gunby. There were about two hundred and fifty members and guests present. A number of the guests were from the Boston Section, A. S. M. E., and the Boston Section, A. I. E. E., whose members had been specially invited to attend.

The minutes of the previous meeting were approved as printed in the November Journal.

The Secretary announced the names of those elected to membership by the Board of Government at meetings held on November 21, 1923, and December 19, 1923.

November 21, 1923. *Member:* Edward Joshua Oakes.

Juniors: Sidney S. Anthony, Kenneth Lawrence Barton, Wesley Richard Bray, Harold Albert Buck, Michael Arnold Carchia, Morris Cohen, Wilbert Hamilton Connor, George Crouse Houser, Arthur Maurice King, Chester F. Langley, Burton Cranston Parker, Charles N. A. Richards, Elton Otis Stearns, William Gerard Stephenson.

December 19, 1923. *Members:* Horace Burr Perry, Richard Gaines Tyler.

Juniors: Donald Van Court Birrell, George Gustave Borgen, Hugh Donald Chase, Ralph Rutherford Dresel, Theodore Thomas Lessard, Edward Robert McCarthy, Sorun P. Schumavonian, Harry Lawrence Thompson.

The Secretary announced the death of Hiram Allen Miller, a member of the Society, on November 2, 1923. The President stated that a committee would be appointed to prepare a memoir.

It was *voted* that the Board of Government be authorized to use the income from the permanent fund for the current year to such an extent as they deemed necessary in payment of the current expenses of the Society. This vote was also passed at the meeting on October 17, 1923, but in accordance with the By-Laws an affirmative vote by the Society at two successive regular meetings was necessary to authorize such action.

The speaker of the evening was William Monroe White, Manager and Chief Engineer of the Hydraulic Department, Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, who spoke on "Hydro-Electric Development with Special Reference to the Hydraulic Equipment."

Mr. White's address, which was fully illustrated with lantern slides, furnished one of the most interesting programs which the Society has had. After speaking briefly of the potential water power as yet undeveloped throughout the world, Mr. White outlined very clearly the types of turbines best adapted to different ranges of heads. He then described in detail many of the improvements which had been made in turbine and draft tube design. One of the most important developments in the hydro-electric field has been the automatic station with its improved equipment, and this was completely described and illustrated by Mr. White in the course of his talk. At the end of his paper Mr. White answered a number of questions amplifying many points which had been touched upon in his talk.

Mr. Desmond FitzGerald, an honorary member of the Society, expressed his appreciation of the able presentation which Mr. White had made of his subject and moved a vote of thanks. After an acknowledgment to Mr. H. A. Hageman, a member of the Committee on Papers and Program of the Society, who had

been so successful in securing Mr. White for this meeting, the President, Frank M. Gunby, called for a rising vote of thanks to the speaker of the evening.

The meeting adjourned about 10 P.M.

J. B. BABCOCK, *Secretary*.

SANITARY SECTION

BOSTON, December 5, 1923. — A meeting of the Sanitary Section of the Boston Society of Civil Engineers was held in Myers Hall, Tremont Temple, on the above date, with Chairman John P. Wentworth presiding.

Col. Charles R. Gow presented a paper illustrated with slides on the "Behavior and Methods of Control of Quicksand and Other Soils met in Ordinary Excavation."

Following the paper, the subject was discussed by Messrs. Edgar S. Dorr, Leonard Metcalf, Frank A. Marston, Gordon Fair, E. S. Larned, A. L. Gammage, J. E. L. Monaghan, President F. M. Gunby and others.

The attendance was sixty-four.

HARRISON P. EDDY, Jr., *Clerk*.

DESIGNERS SECTION

BOSTON, December 12, 1923. — The regular December meeting of the Designers Section of the Boston Society of Civil Engineers was called to order at 6.15 P.M. by Chairman Walter W. Clifford.

The report of the November meeting was read and approved.

The Chairman reminded the members that the regular January meeting would be omitted and in its place the Designers Section would conduct the January meeting of the main Society.

The Chairman introduced Mr. John J. Gillespie, Head of the Industrial Engineering Division of the Department of Agencies, United Shoe Machinery Corporation. Mr. Gillespie spoke upon "The Design of an Ideal Shoe Factory Building." He showed the importance of having the building about 45 feet wide with one row of interior columns, four stories high and with a live load of one hundred and fifty pounds per square foot. The

complete process of shoe manufacture was outlined. A discussion followed the talk.

There were thirty-three members and visitors present.

The meeting adjourned at 8.20 P.M.

WALDO F. PIKE, *Clerk.*

NORTHEASTERN UNIVERSITY SECTION

BOSTON, December 14, 1923. — A meeting of the Northeastern University Section of the Boston Society of Civil Engineers was held today at the University.

Harold W. Kelly, Chairman, called the meeting to order at 11 A.M.

James W. Ingalls, Assistant Professor of Civil Engineering, Northeastern University, was the speaker. His subject was "A Railroad Construction Job," and he described the reduction of grade and revision of alignment of the Waterville-Clinton Improvements of the Maine Central Railroad.

Meeting adjourned at 12 noon.

FRED W. CHASE, Jr., *Clerk.*

APPLICATIONS FOR MEMBERSHIP

[January 15, 1924]

The By-Laws provide that the Board of Government shall consider applications for membership with reference to the eligibility of each candidate for admission and shall determine the proper grade of membership to which he is entitled.

The Board must depend largely upon the members of the Society for the information which will enable it to arrive at a just conclusion. Every member is therefore urged to communicate promptly any facts in relation to the personal character or professional reputation and experience of the candidates which will assist the Board in its consideration. Communications relating to applicants are considered by the Board as strictly confidential.

The fact that applicants give the names of certain members as reference does not necessarily mean that such members endorse the candidate.

The Board of Government will not consider applications until the expiration of twenty (20) days from the date given.

For Admission

CUMMINGS, MATTHEW J., Dorchester, Mass. (Age 32, b. Dorchester, Mass.) Graduate of Mechanic Arts High School in 1909, and in July of that year he went to work for the General Electric Co. at West Lynn as apprentice draftsman. While there he attended daily sessions of the apprentice school. In 1910 he entered the employ of Fore River Shipbuilding Co.; in June, 1912, he entered the employ of the United Printing Machinery Co. as mechanical draftsman; June, 1913, went to work for the Boston Elevated in the civil engineering department, where he remained until 1914; in December, 1915, entered the Sewer Department of the city of Boston, and in 1917 was transferred to the Park Department and is now civil engineer in this department. Refers to E. S. Dorr, E. S. Larned, J. E. L. Monaghan and E. F. Murphy.

DIXON, G. GALE, Melrose, Mass. (Age 38, b. New York City). Graduate of College of City of New York with degree B.S. 1908-09 draftsman, New York State Barge Canal; 1910-11, assistant engineer, New York Board of Water Supply; 1912-15, assistant engineer with F. A. Barbour and E. G. Bradbury on design and construction of water works for Akron, Ohio; 1916-22,

chief engineer, Bureau of Water Works Improvements, Akron, O., enlarging and extending water works; 1922-date member of firm of Barbour & Dixon, consulting hydraulic and sanitary engineers. Refers to F. A. Barbour, E. G. Bradbury, Leonard Metcalf, R. S. Weston.

KINGSBURY, FRANCIS HENRY, Medfield, Mass. (Age 34, b. Medfield, Mass.) Graduate of Mass. Inst. of Tech. in 1912 in sanitary engineering. In State Dept. of Public Health in 1912-17, and in the Engineering Division from 1919-23. From 1917-19 was enlisted in the U. S. Army Corps of Engineers. Is now assistant engineer in the Mass. Dept. of Public Health. Refers to F. L. Flood, X. H. Goodnough, N. L. Hammond, K. R. Kennison, A. D. Weston, Edward Wright.

MAHONEY, FREDERICK A., South Boston, Mass. (Age 25, b. South Boston, Mass.) Was with the Boston Elevated, in architectural department, in 1916; Tufts College, 1917; U. S. Navy, 1918; Tufts College, 1918-19; Boston Elevated, architectural department, 1919-23 as structural draftsman, and since May, 1923, has been general foreman of building construction. Refers to F. C. Bell, C. T. Fernald, J. R. McLeish, J. T. Shea.

For Transfer from Grade of Junior

HORTON, FREEMAN HUDSON, St. Augustine, Fla. (Age 26, b. Bradentown, Fla.) Was educated at the University of North Carolina, Mass. Inst. Tech. and Harvard University. In November, 1918, entered the U. S. Army, Engineer Officers' Training Corps, and was honorably discharged after the Armistice. December, 1918-April, 1919, computer, U. S. Coast and Geodetic Survey, Washington, D. C.; April, 1919-August, 1919, designer, bridge department, Illinois State Highway Commission; December, 1919-October, 1920, designing engineer, Florida State Road Dept.; October, 1920-April, 1921, designer and draftsman, American Bridge Co.; April, 1921-April, 1922, in private practice; April, 1922, to date, structural draftsman, then assistant engineer, Florida East Coast Ry. Co. Refers to J. B. Babcock, G. L. Hosmer, J. W. Howard, H. J. Hughes, L. J. Johnson, Dwight Porter, C. M. Spofford.

For Transfer from Grade of Associate

ROWE, RANSOM, Brighton, Mass. (Age 57, b. Burlington, Vt.) Engaged for over thirty years on engineering work. Last twenty years as contractor for water works, roads, bridges and tunnels. Refers to Joshua Atwood, E. S. Larned, C. R. Gow, Channing Howard, H. V. Macksey, E. H. Rogers.

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BOOK REVIEW

"STRESSES IN FRAMED STRUCTURES," by George A. Hool, Consulting Engineer, Professor of Structural Engineering, University of Wisconsin; and W. S. Kinne, Professor of Structural Engineering, University of Wisconsin, Editors-in-Chief; and the following Associate Editors; Chas. A. Ellis, Vice President, Strauss Bascul Bridge Company; Robins Fleming, Structural Engineer, American Bridge Company; S. G. Roeblad of Clifford & Roeblad, Consulting Engineers; H. S. Rogers, Professor of Irrigation Engineering, Oregon State Agricultural College; C. A. Willson, Engineer for Wisconsin State Architect; and Wilbur M. Wilson, Research Professor of Structural Engineering, University of Illinois. First Edition. McGraw-Hill Book Company, New York. 620 pp.

REVIEWED BY JOHN R. NICHOLS*

In their preface, the Editors-in-Chief describe the book as one of a series intended as a "reference work" covering the design and construction of modern civil engineering structures. In form and appearance it resembles a treatise, but if regarded as such it falls far short in the fullness and clearness of exposition necessary for a treatise. The treatment, while thorough in the sense that practically every conceivable case is dealt with, is concise to the point where a novice would have difficulty in grasping the fundamentals. The proficient engineer could, by following the text closely, refresh his mind in the reasoning and methods involved in the design and analysis of frames. In some of the chapters the order of development of the theory is not logically that of a treatise. On the other hand, the completeness of the explanations makes it much more than a handbook. Perhaps "reference work" describes it as accurately as any term, and for this purpose the book undoubtedly has great merit.

The first section, "General Theory" (158 pages), gives a brief description of trusses and loads, develops the principles of statics both by algebraic and by graphic methods, and treats of moving loads. Much space is given to the last subject (74

* Consulting Engineer, 161 Devonshire Street, Boston, Mass.

pages) and convenient tabulations of moments, etc., for Cooper's E 50 loading are presented.

Section 2 (52 pages) deals with roof trusses. The most striking feature is thirty-two tables of stress coefficients for members of common types of pitched-roof trusses subject to vertical and wind loads. Graphic and algebraic methods for the determination of stresses are described and illustrated.

Section 3 (116 pages) describes the methods of computing stresses in members of bridge trusses of the various types in modern use. Stresses due to wind, curvature of track and tractive effort are included.

Section 4 (30 pages) treats of sway and portal bracing.

In section 5 (77 pages) algebraic and graphical methods are described for determining deflections of trusses. This leads naturally into a discussion of stresses in redundant members and secondary stresses.

Section 6 (15 pages) is a short but comprehensive treatment of stresses in statically indeterminate frames which culminates in a set of seventy-eight tables presented in Appendix A. These tables give first, the general formulas for bending moment at the ends of a bar subject to transverse loading and lateral deformation; second, evaluation in terms of known quantities of the constants entering the general formulas for twenty special types of loading; and third, end moments in members of common indeterminate structures subject to varying special types of loading, a total of over four hundred cases. The types of structures include completely and partially fixed and freely supported beams of one, two and three spans, equal or unequal, with supports level or settled; two and three legged rectangular and trapezoidal bents, hinged or fixed at the base, equal or unequal legs, and with level or settled foundations; and square and rectangular closed frames. The tabulation brings from the well-known elastic theory enough information to resolve in each case the statical indetermination, and presents it in the most convenient and reduced form for many common special cases of frame and loading.

Sections 7 and 8 discuss wind stresses in high buildings and stresses in framed towers, respectively.

Throughout, the book is profuse with numerical illustrations. The style is vigorous and concise, to the point, at times, of seeming hurried, and there are some inaccuracies of statement in the text, which, however, are not likely to mislead a trained engineer. If the figures and tables may be relied upon the busy engineer who has to deal frequently or occasionally with framed structures will find the book a valuable addition to his reference shelf.

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Fourteenth Census of the United States. Vol. II.

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Report of Library of Congress, 1923.

Report of Director, U. S. Coast and Geodetic Survey. 1923.

Miscellaneous.

Source-Book of Research Data. N. Y. Univ., Bureau of Business Research. 1923.

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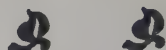
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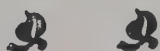
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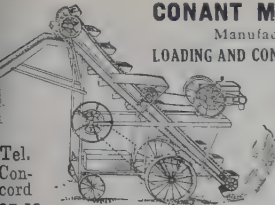
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